

APPLICATION OF VASCULAR PLANTS FOR BIOREMEDIATION OF PERCHLORATE: UNRAVELING THE MYSTERIES

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ABSTRACT: Recent research suggests that vascular plants may provide a viable means of remediating sites contaminated with perchlorate, a possible endocrine disruptor. If results of in situ and on-site trials are consistent with top results of laboratory experiments, bioremediation of perchlorate using vascular plants could increase efficiency of remediation; reduce initial capital outlay and required maintenance; and transform contaminants into substances that are not hazardous to human health. Results from short-term laboratory-scale experiments with two related species of halophytes, pickleweed (*Allenrolfea occidentalis*) and perennial glasswort (*Salicornia virginica*), exemplify the range of variation that may occur under different conditions of ion availability. For perchlorate concentrations typical of contaminated sites (20 ppm), approximately 29% and 43% was depleted from solution within ten days in the presence of pickleweed, for the unwashed-sand treatment with nutrients, and the washed-sand (chloride removed) treatment without nutrients, respectively. For the same concentration of perchlorate and exposure time, approximately 13% and 68% was depleted from solution in the presence of perennial glasswort for washed-sand treatments with and without nutrients, respectively. The efficiency of mass depletion of perchlorate by perennial glasswort in washed-sand, without nutrients treatment, 3138 mg of perchlorate removed per Kg of plant weight was approximately an order of magnitude greater than results for all previously referenced treatments. Analysis of plant tissues confirmed that transformation of perchlorate had occurred in the plants within ten days for these treatments. Depletion of perchlorate from solution in the presence of these species occurs as first-order reactions. Results of this experiment, combined with knowledge of the ecological aspects of these plants, provide the basis for designing more detailed, long-term experiments to resolve the mysteries of phytotransformation processes of perchlorate.